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CLIMATE CHANGE

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File - Global Climate

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ISSUE PAPER
GLOBAL CLIMATE CHANGE

BACKGROUND

There is general agreement in the world scientific community that a buildup of carbon dioxide and other radiatively active gases is occurring in the upper atmosphere. The consensus of current science is that the amount of CO2 and trace gases in the atmosphere, most noteably nitrous oxide (N2Ø) methane (CH4), ozone,and the chloroflurocarbons, are increasing. Since these gases absorb and emit longwave radiation they are capable of influencing the earth's climate. The continuing buildup of these "greenhouse" gases are likely to be ~~the most~~ an important cause of climate change over the next century. While early concerns focused on the role of CO2 in the global warming process, there is now growing acceptance that the role of other greenhouse gases in changing the climate will become about as important as CO2. There is general agreement that if present trends continue, the combined concentrations of atmospheric CO2 and other greenhouse gases would be approximately radiatively equivalent to a doubling of CO2 from pre-industrial levels. Some researchers predict that a ~~an~~ doubling could take place as early as 2030, but most estimates call for it to occur later in the 21st century.

Current experiments using the most sophisticated general circulation models of the climatic system show that increases of the global mean equilibrium surface temperature of between 1.5 and 4.5 degrees C. would be associated with the predicted doubling of atmospheric CO2 concentrations (or equivalent concentrations). Most recent work tends toward the upper limit, although this is not yet apparent from observations. The complexity of the global climatic system, the imprecision of the models, and major gaps in present knowledge -- particularly in the area of ocean-atmosphere interactions and clouds -- makes precision impossible until further research progress is made in these areas. Other factors may also influence climate change but none will be as important as the greenhouse gases during the next century.

Most of the global climate change issues are related. Some impacts, such as a rise in surface temperature and sea level rise have long been linked. As we learn more about the relevant tropospheric chemistry, the relationship between these greenhouse effects and other effects such as depletion of the ozone layer are becoming more apparent. The linkage stems from common or related emission sources and the chemical interaction of the various gases whose increased concentration can lead, for example, to both a surface temperature rise and reduction of tropospheric ozone. It should also be noted that the greenhouse temperature changes (tropospheric warming and stratospheric cooling) significantly modify the predictions for ozone and other pertubations of atmospheric composition, yet this interaction has

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been largely ignored. Such complex relationships also suggest a possible need to consider regional scale phenomenon (e.g. methane emissions and their atmospheric chemistry) in concert with the global scale atmospheric issues since they too have some common emission species, emission sources and related chemistry.

The growing realization of these interactions has led to the creation of a number of interdisciplinary research programs. The U.S. National Academy of Sciences (NAS) International Geosphere-Biosphere Program and the International Council of Scientific Unions (ICSU) Global Change Program are two key examples. Other programs include the World Meteorological Organization (WMO) World Climate Program, and the International Institute for Applied Systems Analysis (IIASA) Sustainable Global Development Program.

DISCUSSION

Concern over the increased atmospheric concentrations of these gases and the potential consequences of these higher concentrations (e.g. global warming, changes in precipitation patterns, sea level rise and depletion of the ozone layer) has caused interest across a number of agencies, Congressional Committees, and international organizations. Also at issue are the direct and indirect impacts on human health, the environment, global settlement patterns, etc. These include a potential for increased basal cell skin cancer, dramatic changes in some of the world's coastlines, potential elimination of major portions of tropical rainforests, etc.

NASA, NSF, NOAA, DOE, and EPA all have substantial research programs dealing with one or more aspects of the issue. Others, such as State, USDA, DOI, and AID are interested in the policy and scientific implications that may flow from the research.

Internationally, WMO, the United Nations Environment Program (UNEP), and ICSU are all involved in the issue both seperately and cooperatively through the World Climate Program. Recent events such as the Convention for Protection of the Ozone Layer signed last summer and the joint UNEP/WHO/ICSU Conference on CO2 and other greenhouse gases (Villach, October, 1985) provided a major impetus to the need to reexamine our approach to these issues. Others, such as the World Resources Institute (Washington, D.C.) and IIASA in Vienna, Austria have major program components which dealing with various aspects of the issue.

Recently, interest domestically has also expanded to Congress where the Senate held hearings on global climate change in December 1985 and June 1986. A Concurrent Resolution (S.Con.Res.96) calling for the President to establish an "International Greenhouse Year" which would be similiar to the earlier IGY was introduced this spring.

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Generally, this interest has evolved from the realization that increasing concentrations of the radiatively active ("greenhouse") gases may lead to global climate change which could be significantly outside historically measured ranges for the current interglacial period. While there is general agreement that much of this concentration has anthropogenic causes there is also general agreement that immediate drastic policy action is not required. There is, however, a large group of scientists and senior analysts who feel that in order to be able to implement necessary policy sometime in the future we must begin to identify options and strategies today. Policy analysis of this type, they say, must go on parallel with the scientific efforts; it cannot wait for more concrete scientific results.

As scientific study continues to develop chemical and physical linkages between a number of these phenomenon such development also points out the need for coordinated interdisciplinary policy analysis. These research findings, coupled with the rapid proliferation of interdisciplinary global change programs and the significant number of specific domestic and international research and policy iniatives dealing with aspects of the issue requires better federal government coordination.

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